

ASUS Storage DS300j User Manual

Version 1.0

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This version of the *User Manual* supersedes all previous versions.

Recommendations

In this *User Manual*, the appearance of products made by other companies, including but not limited to software, servers, and disk drives, is for the purpose of illustration and explanation only. ASUS Technology does not recommend, endorse, prefer, or support any product made by another manufacturer.

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Chapter 1: Introduction to ASUS Storage

This chapter covers the following topics:

- About This Manual (below)
 - Features (page 2)
 - Specifications (page 3)
-

About This Manual

This *Product Manual* describes how to setup, use, and maintain the ASUS Storage DS300j expansion unit. It also describes how to use the built-in command-line interface (CLI).

This manual includes a full table of contents, index, chapter task lists, and numerous cross-references to help you find the specific information you are looking for.

Also included are four levels of notices:



Note

A *Note* provides helpful information such as hints or alternative ways of doing a task.



Important

An *Important* calls attention to an essential step or point required to complete a task. Important items include things often missed.



Caution

A *Caution* informs you of possible equipment damage or loss of data and how to avoid them.



Warning

A *Warning* notifies you of probable equipment damage or loss of data, or the possibility of physical injury, and how to avoid them.

Figure 1. ASUS Storage front view

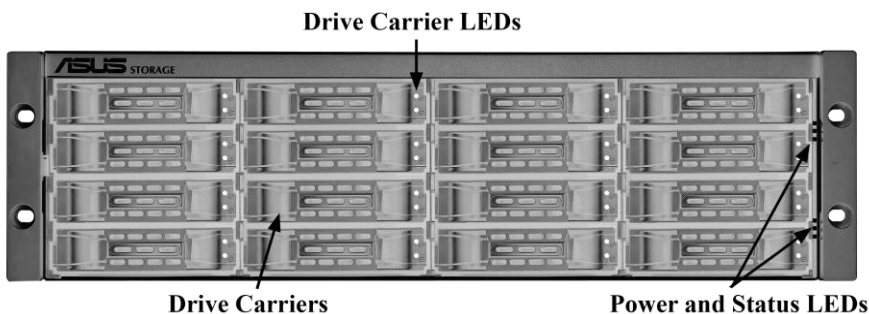
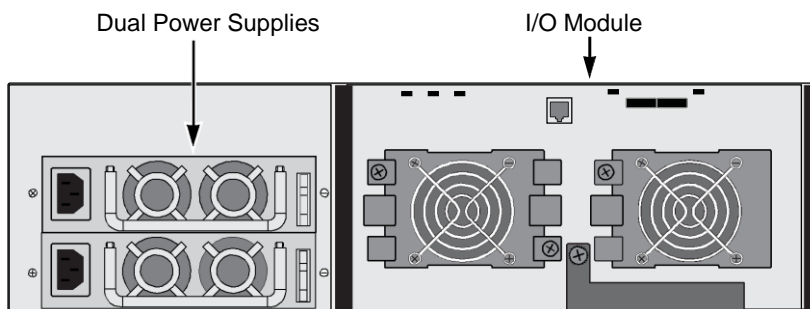


Figure 2. ASUS Storage DS300F rear view



Features

- 3.5" x 1" SAS 3 Gb/s drives
- 3.5" x 1" SATA 3 Gb/s drives
- Any combination of SAS and SATA drives in the same system.
- Hot-swappable drive bays.
- Staggered physical drive spin-up.
- Redundant, hot-swappable power supplies.
- Command Line Interface via RJ-11 Serial Port.
- Three years complete system limited warranty includes 24 x 7 email and phone support with highly experienced technical support technicians and an advanced replacements program.
- Compatible with leading SAS hard drives, host bus adapters, and RAID controllers.

- OS support:
 - Windows 2008 Server, 2003 Server
 - Red Hat Linux, SuSE Linux
 - FreeBSD, VMware ESX 4.0
- Supports all background activities running on ASUS Storage subsystem

Specifications

Power Supply

450W, Dual hot-swappable and redundant, 100-240 VAC auto-ranging, 50-60 Hz, with PFC

Current (maximum)

8 A @ 100 VAC or 4 A @ 240 VAC current rating with two power cords

Power Consumption

Without disk drives, 72.2 W; with disk drives, 242.3 W

Temperature

Normal conditions:

5° to 40°C operational (-40° to 60°C non-operational)

Conditions of running SAS disk drives with one failed cooling fan:

5° to 35°C operational (-40° to 60°C non-operational)

Relative Humidity

95 percent maximum

Vibration

Random, 0.21 grms, 5-500 Hz, 30 Mins, X, Y, Z axis.

Dimensions (H x W x D)

13 x 45 x 46 cm (5.1 x 17.7 x 18.1 in)

Net Weight

16.6 kg (36.1 lb) without drives, 24.6 kg (53.5 lb) with 16 drives*

* Assuming 0.5 kg (1.1 lb) per drive.

Carton Dimensions (H x W x D)

28.5 x 57.2 x 75.2 cm (11.2 x 22.5 x 29.6 in)

Carton Weight

21.6 kg (47.6 lb)

Safety

BSMI, CB, CCC, CE, FCC Class A, MIC, VCCI, UL, cUL, TUV.

Environmental

RoHS, China RoHS.

Warranty and Support

Warranty: Three year limited warranty on all components except the optional battery backup unit, which has a one-year warranty.

Support: 24x7 email and phone support (English only). 24x7 access to ASUS support site for drivers, firmware, and compatibility.

CE Statement

Warning: This is a class B product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

KCC Statement

A급 기기 (업무용 정보통신기기)

이 기기는 업무용으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며, 만약 잘못판매 또는 구입하였을 때에는 가정용으로 교환하시기 바랍니다.

Chapter 2: ASUS Storage Installation

This chapter covers the following topics:

- Unpacking the ASUS Storage (below)
 - Mounting ASUS Storage in a Rack (page 6)
 - Installing Disk Drives (page 9)
 - Making Data and Management Connections (page 11)
 - Setting Up Serial Cable Connections (page 13)
 - Connecting the Power (page 14)
 - Setting up the Serial Connection (page 16)
-

Unpacking the ASUS Storage

The ASUS Storage product box contains the following items:

- ASUS Storage DS300j unit
- *Quick Start Guide* printed
- RJ11-to-DB9 serial data cable
- Screws for disk drives (70 pieces)
- 1.5m (4.9 ft) Power cords (2)
- CD with *User Manual* and *Quick Start Guide* in PDF format



Warning

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.



Warning

The electronic components within the ASUS Storage enclosure are sensitive to damage from Electro-Static Discharge (ESD). Observe appropriate precautions at all times when handling the ASUS Storage or its subassemblies.

Mounting ASUS Storage in a Rack



Cautions

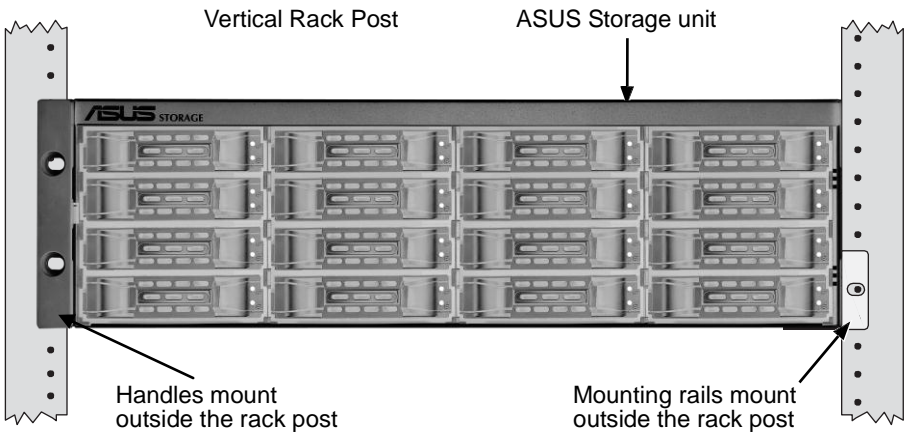
- At least two persons are required to safely lift, place, and attach the ASUS Storage unit into a rack system.
 - Do not lift or move the ASUS Storage unit by the handles, power supplies or the controller units. Hold the subsystem itself.
 - Do not install the ASUS Storage unit into a rack without rails to support the subsystem.
 - Only a qualified technician who is familiar with the installation procedure should mount and install the ASUS Storage unit.
 - Be sure all switches are OFF before installing the ASUS Storage unit or exchanging components.
 - Mount the rails to the rack using the appropriate screws and flange nuts, fully tightened, at each end of the rail.
 - Do not load the rails unless they are installed with screws as instructed.
 - The rails available for the ASUS Storage unit are designed to safely support that ASUS Storage unit when properly installed. Additional loading on the rails is at the customer's risk.
 - ASUSTek COMPUTER INC. (Taiwan) cannot guarantee that the mounting rails will support your ASUS Storage unit unless you install them as instructed.
-



Note

To lighten the ASUS Storage enclosure, remove the power supplies. Replace the power supplies after the ASUS Storage unit is mounted in your rack.

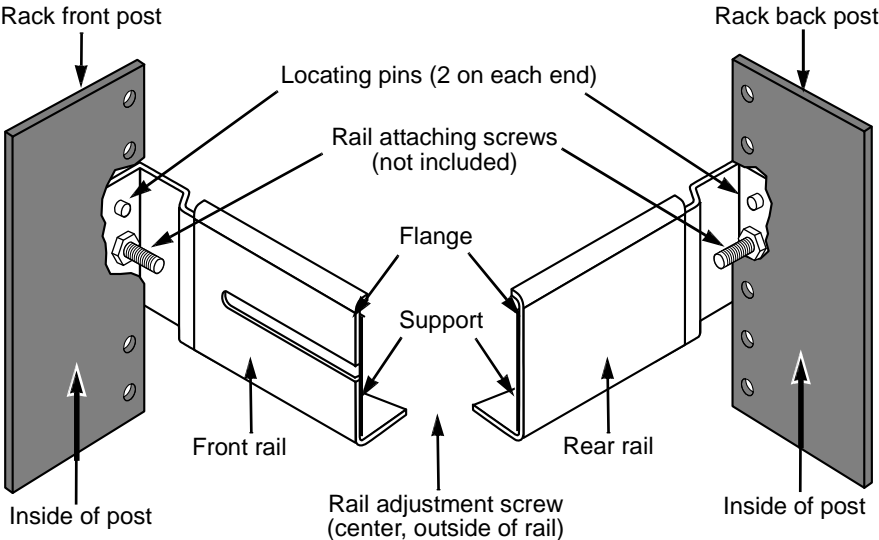
The ASUS Storage DS300j unit installs to the rack using the available mounting rails. You can also use your existing rails.

Figure 1. DS300j unit mounted in a rack with the available rails

To install the ASUS Storage unit into a rack with the available mounting rails:

1. Check the fit of the mounting rails in your rack system.
See page 8, Figure 2.
2. Adjust the length of the mounting rails as needed.
The rear rail slides inside the front rail. The rail halves are riveted together and use no adjustment screws.
3. Attach the mounting rail assemblies to the outside of the rack posts, using the attaching screws and flange nuts from your rack system.
Be sure the front rail support is on the bottom facing inward.
The alignment pins fit into the rack holes above and below the attaching screws.
Use the attaching screws and flange nuts from your rack system. Tighten the screws and flange nuts according to your rack system instructions.
4. Place the ASUS Storage unit onto the rails.
5. Secure the ASUS Storage unit to the rack.
One screw each side, in the upper hole only. Use the attaching screws and flange nuts from your rack system. Tighten the screws and flange nuts according to your rack system instructions.

Figure 2. Rack mount assembly diagram



This completes rack mounting. Go to “Installing Disk Drives” on page 9.

Installing Disk Drives

The ASUS Storage DS300F and DS300I subsystems and DS300j expansion units support:

- SAS and SATA hard disk drives
- 3.5-inch hard disk drives

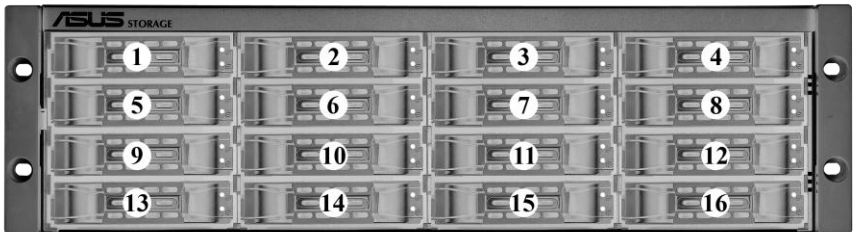
For a list of supported physical drives, download the latest compatibility list from the ASUS support web site <http://support.asus.com/>.

Drive Slot Numbering

You can install any suitable disk drive into any slot in the enclosure. The diagram below shows how ASUS Storage's drive slots are numbered. Whether you have the original or plus carriers, the slots are numbered the same.

Slot numbering is reflected in the ASUS Storage Management and CLU user interfaces. See Figure 3.

Figure 3. ASUS Storage drive slot numbering

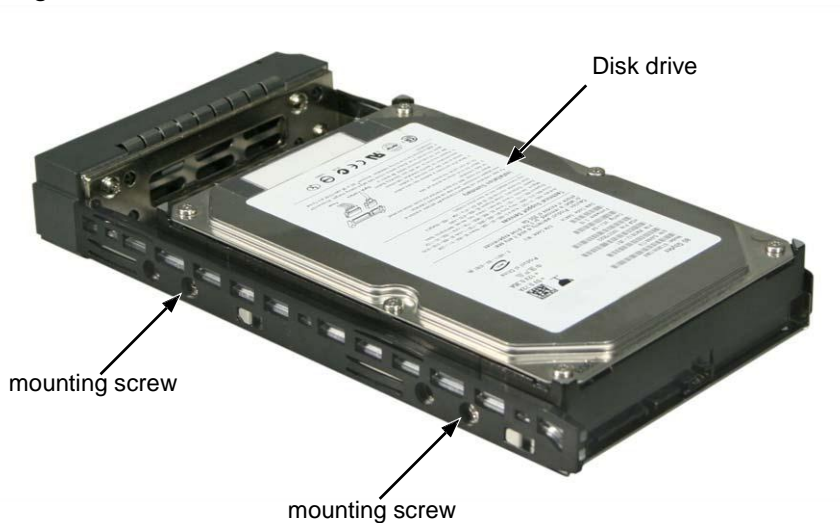


Install all of the drive carriers into the ASUS Storage enclosure to ensure proper airflow, even if you do not populate all the carriers with disk drives.

Installing Your Disk Drives

1. Remove a disk drive carrier.
 2. Carefully lay the disk drive into the drive carrier at the front, so that the screw holes on the sides line up.
 3. Insert the screws through the holes in the drive carrier and into the sides of the disk drive.
 - Install only the counter-sink screws supplied with the ASUS Storage.
 - Install four screws per drive.
 - Snug each screw. Be careful not to over-tighten.
 4. Reinstall the drive carrier into the ASUS Storage enclosure.
- Repeat steps 1 through 3 until all of your disk drives are installed.

Figure 4. Disk drive mounted in a drive carrier



Caution

ASUS Storage supports disk drive hot-swapping. To avoid hand contact with an electrical hazard, do not remove more than one drive carrier a time.

This completes disk drive installation. Go to “Making Data and Management Connections” on page 11.

Making Data and Management Connections

Configuring a Data Path

To establish the data path:

1. Make the FC or iSCSI data connections as described in the *ASUS Storage DS300F, DS300I User Manual*.
2. Connect the SAS Expansion port of the DS300F or DS300I subsystem to the SAS IN port on the I/O module of the first DS300j unit.
See page 12, Figure 5.
3. Connect the SAS OUT port on the I/O module of the first DS300j unit to the SAS IN port on the I/O module of the second DS300j unit.
4. Connect the remaining DS300j units in the same manner.
All SAS ports have SFF-8088 connectors.

Configuring a Management Path

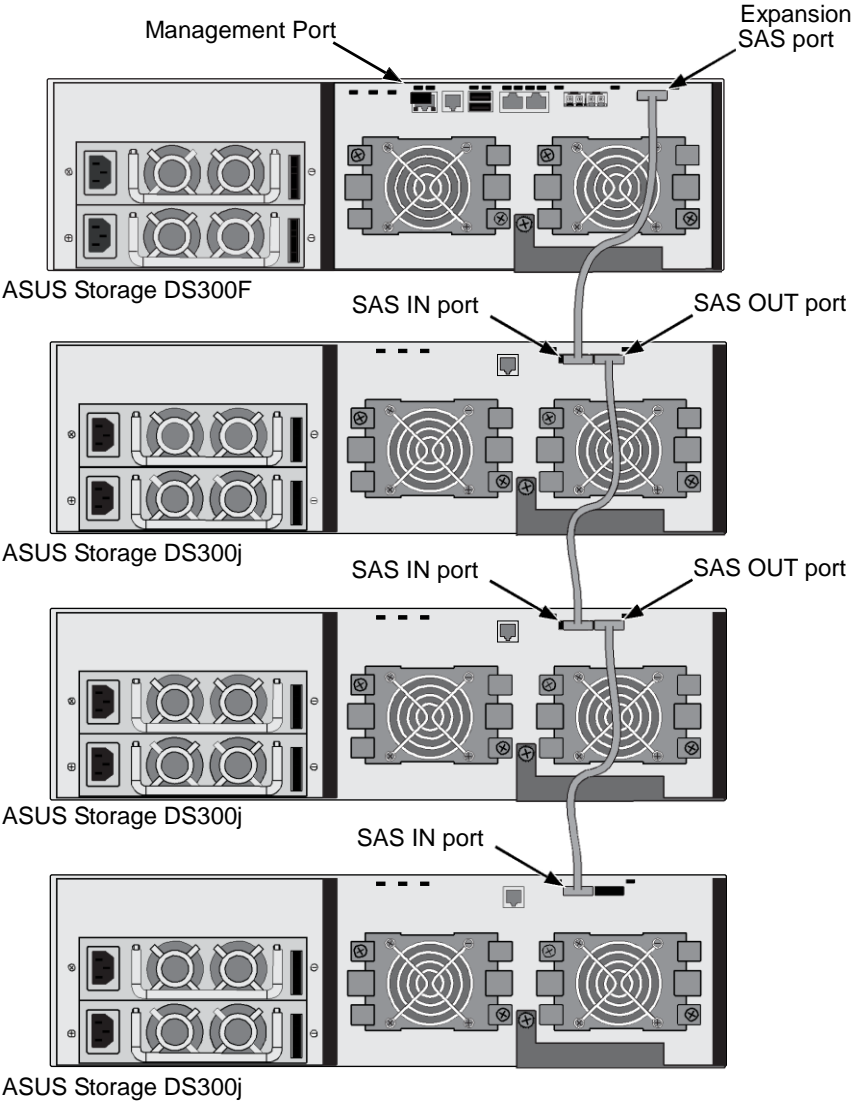
To establish the management path, make the FC or iSCSI management connections as described in the *ASUS Storage DS300F, DS300I User Manual*.

The RAID controller in the ASUS Storage DS300F or DS300I subsystem also monitors and manages the DS300j units. No additional connections are required for ASUS Storage Management or the CLU.

Direct Management of ASUS Storage

A management connection directly to the ASUS Storage DS300j unit has a serial connection to the Host PC. See “Chapter 3: Management” on page 17 for more information.

Figure 5. Data and management connections with ASUS Storage



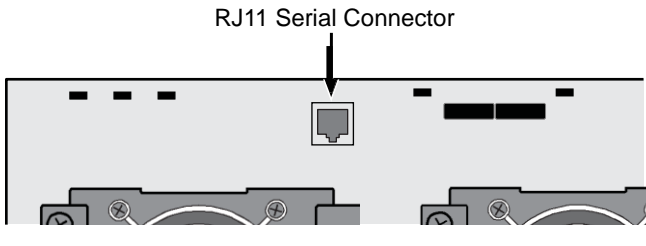
This completes data and management connections. Go to “Setting Up Serial Cable Connections” on page 13.

Setting Up Serial Cable Connections

Serial communication enables the Command Line Interface (CLI) on your PC to monitor and control the ASUS Storage DS300j unit. The product package includes a RJ11-to-DB9 serial data cable.

The CLI is explained in “Chapter 3: Management” on page 17.

Figure 6. The serial connector on the back of the ASUS Storage



To set up a serial cable connection:

1. Attach the RJ11 end of the serial data cable to the RJ11 serial connector on the controller.
2. Attach the DB9 end of the serial data cable to a serial port on the Host PC or Server.

This completes the serial cable connection. Go to “Connecting the Power” on page 14.

Connecting the Power

Plug the power cords into the power supplies on the back of the ASUS Storage DS300j unit and switch on the power supplies.

When the power is switched on, the LEDs light up.



Caution

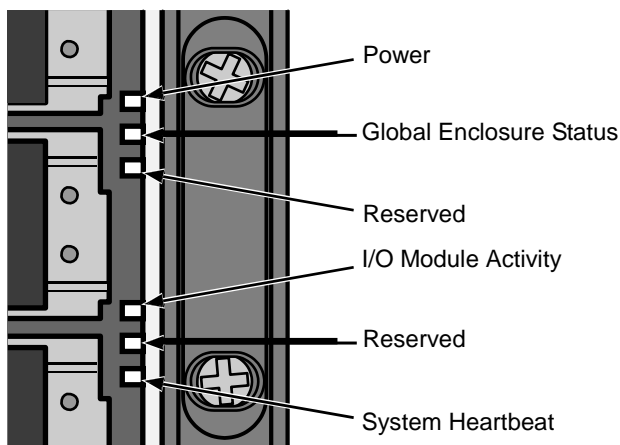
After you turn the power supply switches off, you must wait at least 10 seconds before you turn the power switches on again.

Front Panel LEDs

When boot-up is finished and the ASUS Storage DS300j unit is functioning normally:

- Power and Global Enclosure Status LEDs display green continuously.
- I/O Module Activity LED flashes green when there is controller activity.
- System Heartbeat LED blinks green once per second.

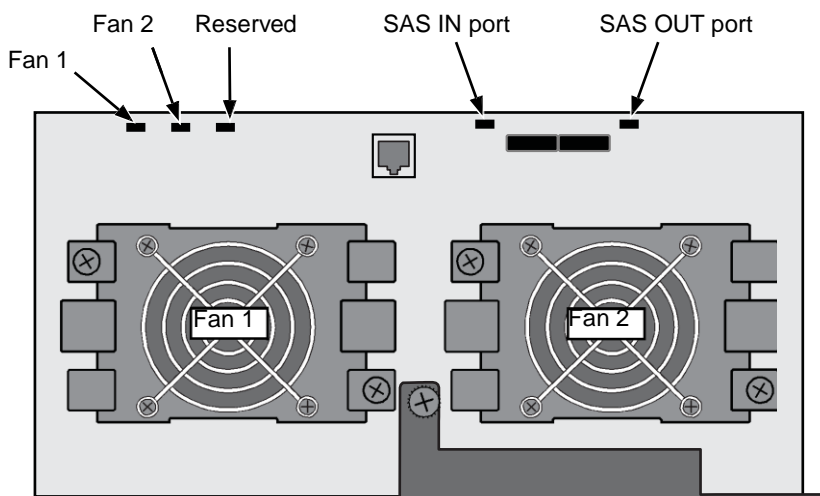
Figure 7. Front panel LED display



I/O Module LEDs

When boot-up is finished and the ASUS Storage subsystem is functioning normally:

- Fan LEDs display green continuously.
- SAS port LEDs flash green when there is activity.

Figure 8. ASUS Storage I/O Module LEDs

Disk Drive LEDs

There are two LEDs on each drive carrier. They report the presence of a disk drive, activity of the drive, and the drive's current condition.

Figure 9. Drive carrier LEDs

If there is a disk drive in the carrier, the Power/Activity LED displays green. If not, the Power/Activity LED remains dark. The Power/Activity LED flashes during drive activity.

The Disk Status LED displays green when a drive is configured.

This completes the power and start-up. Go to “Setting up the Serial Connection” on page 16.

Setting up the Serial Connection

The ASUS Storage DS300j unit has a Command Line Interface (CLI) to manage all of its functions via your PC's terminal emulation program, such as Microsoft HyperTerminal. This procedure uses the serial cable connection you made on page 13.

You must use the serial connection to run the CLI for direct management of the ASUS Storage DS300j unit. See "Chapter 3: Management" on page 17.

To set up a serial connection:

1. Change your terminal emulation program settings to match the following specifications:
 - Bits per second: 115200
 - Data bits: 8
 - Parity: None
 - Stop bits: 1
 - Flow control: none
2. Start your PC's terminal VT100 or ANSI emulation program.
3. Press Enter once to launch the CLI.

When connected and ready, the CLI screen displays:

```
*****
      ASUS SAS Expander v2.00.0000.xx
*****

cli>
```

The **cli>** prompt on your screen indicates that you have a connection and the CLI is ready to accept commands.

Chapter 3: Management

This chapter covers the following topics:

- LEDs (below)
- CLI Command Set (page 21)

When attached to a ASUS Storage DS300F or DS300I subsystem, you can manage the ASUS Storage DS300j unit with the ASUS Storage Management software or the Command Line Utility (CLU). See the *ASUS Storage DS300F, DS300I User Manual* for more information.

This chapter describes monitoring and management functions directly from the ASUS Storage DS300j unit through its Command Line Interface (CLI).

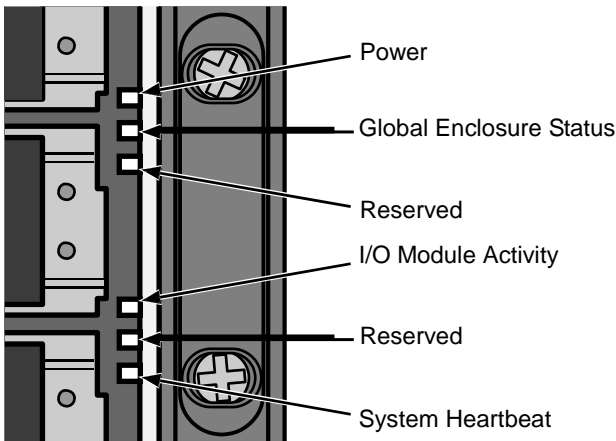
LEDs

Front Panel LEDs

When boot-up is finished and the ASUS Storage DS300j unit is functioning normally:

- Power and Global Enclosure Status LEDs display green continuously.
- I/O Module Activity LED flashes green when there is controller activity.
- System Heartbeat LED blinks green once per second.

Figure 1. Front panel LED display



See the table on the next page.

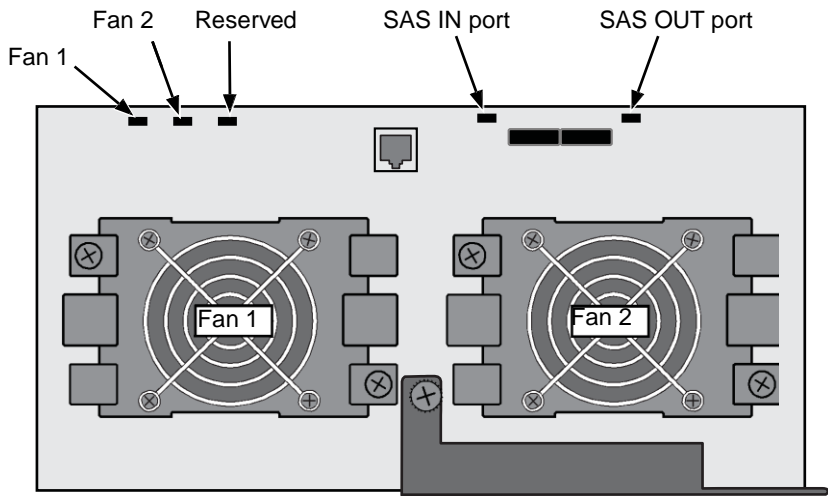
| LEDs | State | | | | |
|------------------------------------------------------------------------|--------------------------------------|---------------------------------|------------------------|-----------------------------------------------------|-----|
| | Dark | Steady Green | Flashing Green | Amber | Red |
| Power | System Off | Normal | — | — | — |
| Global Enclosure Status | System Off | Normal | Locating the Enclosure | Fan, power supply, temperature, or voltage problem* | |
| I/O Module Activity | System Off or no SAS ports connected | One or more SAS ports connected | Activity | — | — |
| Controller Heartbeat | System Off | — | Normal** | — | — |
| * Check the I/O Module LEDs on the back of the enclosure. See page 19. | | | | | |
| ** Blinks green once per second. | | | | | |

I/O Module LEDs

When boot-up is finished and the ASUS Storage subsystem is functioning normally. These LEDs give the status of individual components:

- Fan LEDs display green continuously.
- SAS port LEDs flash green when there is activity.

Figure 2. ASUS Storage I/O Module LEDs

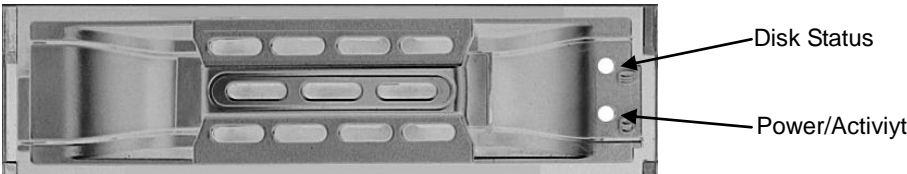


| LEDs | State | | | | |
|-----------|---------------|----------------|----------------------------|----------------------------------|-----------------|
| | Dark | Green | Amber | Red | Blinking |
| Fan | Not detected | OK | One fan turning too slowly | Multiple fans turning too slowly | — |
| SAS Ports | No connection | Port connected | — | — | Green: Activity |

Disk Drive LEDs

There are two LEDs on each drive carrier. They report the presence of a disk drive, activity of the drive, and the drive's current condition.

Figure 3. Drive carrier LEDs



If there is a disk drive in the carrier, the Power/Activity LED displays green. If not, the Power/Activity LED remains dark. The Power/Activity LED flashes during drive activity.

The Disk Status LED displays green when a drive is configured.

If there is a disk drive in the carrier, the Power/Activity LED displays green. If not, the Power/Activity LED remains dark.

The Power/Activity LED flashes during drive activity.

ASUS Storage DS300F or DS300I subsystem controls the Disk Status LED behavior. The Disk Status LED displays green when a drive is configured.

| LEDs | State | | | | |
|------------------------------------------------------------------------------------------------------------|--------------------------|---------------|--------------------|------------------|---------------------|
| | Dark | Steady Green | Flashing Green | Amber | Red |
| Power/Activity | No Drive | Drive Present | Activity | — | — |
| Status* | No Drive or Unconfigured | Drive OK | Locating the Drive | Drive Rebuilding | Array Drive Offline |
| * The RAID subsystem controls Disk Status LED behavior. The pattern described here is from a ASUS Storage. | | | | | |

CLI Command Set

The CLI uses the following set of commands:

- **cable** – Specifies the length of cable for optimal signal quality. See page 21.
- **enclosure** – Displays full information on the ASUS Storage DS300j unit and its components. See page 22.
- **factorydefault** – Restores factory default settings. See page 25.
- **help** – Use alone to see the list of commands. Use with a command to see a list of options. Examples: **enclosure -help** or **enclosure -h**. See page 26.
- **link** – Displays the current status of the PHYs (links), error counter, expander and attached SAS addresses. See page 26.
- **route** – Displays addresses of components through a downstream (expansion) connection. See page 31.
- **uptime** – Displays the number of days, hours, minutes and seconds since the firmware was loaded (since the ASUS Storage was started or restarted). See page 32.
- **vpdr** – Displays vital product data on field replaceable units. See page 32.
- **?** – Use alone to see the list of commands. Use with a command to see a list of options. Example: **enclosure -?** See page 32.



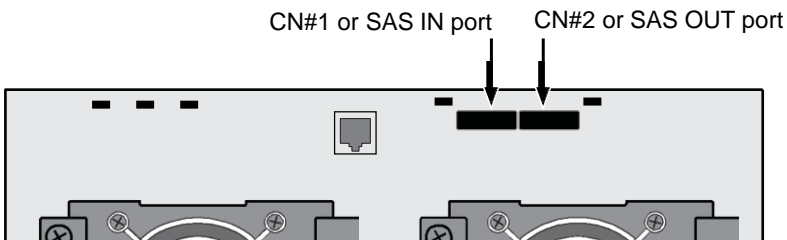
Note

Command options are NOT case-sensitive.

Cable Command

The Cable command displays the current cable length settings for the two SAS ports. The I/O module supports cables from 1 to 8 meters in length.

Figure 4. ASUS Storage SAS ports



CN#1 refers to the SAS IN port and CN#2 refers to the SAS OUT port on the I/O module. See above, Figure 4.

To view the current settings:

At the cli> prompt, type **cable** and press Enter.

The system returns:

```
CN#1 Cable Length = 1 meter
```

```
CN#2 Cable Length = 1 meter
```

To set Expansion connector CN2 for a 3-meter cable:

At the cli> prompt, type **cable -a mod -s "cn2=3"** and press Enter.

The system returns:

```
Cable length of connector 2 is set to 3 meter
```

Enclosure Command

The Enclosure command:

- Enables you to reboot the ASUS Storage enclosure (below)
- Displays information about the ASUS Storage enclosure (page 23)
- Enables you to make enclosure settings (page 24)

Rebooting the Controller



Caution

A controller reboot does NOT meet the system restart requirements for a firmware upgrade.

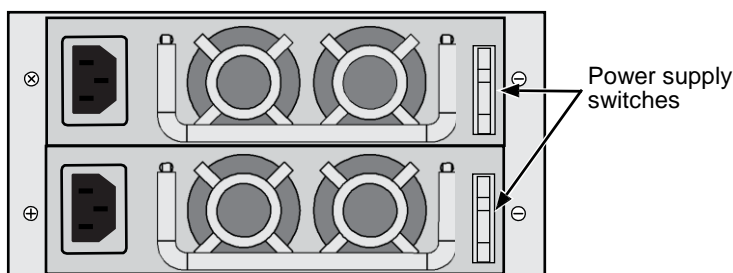
You can reboot just the controller (I/O module). This action might be needed to help with setting changes on the ASUS Storage DS300j.

To reboot the only the controller:

1. Verify that no data I/O activity is in progress.
2. At the cli> prompt, type **enclosure -a mod -s "reboot=1"** and press Enter.
When the cli> prompt reappears, the controller has rebooted.

To reboot the entire DS300j unit:

1. Verify that no data I/O activity is in progress.
2. Turn the power supply switch (switches) OFF.
3. Wait 10 seconds.
4. Turn the power supply switch (switches) ON.
See page 23, Figure 5.

Figure 5. DS300j power supply switches

Viewing Information

To view enclosure information:

At the cli> prompt, type **enclosure** and press Enter.

The system returns:

```
-----
Time since system powerup: 1 day 9 hours 46 minutes 36 seconds
Enclosure       : SAS JBOD 3U-16 Bay
Serial Number   : Cx20j-12345
I/O Module ID   : 1                Max I/O Module Cnt   : 1
Firmware Version : 02.00.0000.xx I/O Module Role       : Primary
Max HDD Slots    : 16                Max Connectors    : 2
Max PSU Cnt      : 2                Max Fan Cnt       : 2
Max Temp Sensor Cnt : 8                Max Voltage Sensor Cnt : 2
=====
```

| CU | Status | Fan1Speed | Fan2Speed |
|----|-------------|-----------|-----------|
| 1 | Operational | 4735 rpm | 4037 rpm |

```
=====
```

| ID | Location | Temp Reading |
|----|------------|--------------|
| 1 | I/O Module | 27C/80F |

```
-----
Thermal Management           : Enabled
Allows to shut down the system when critical
temperature is reached       : Yes
Current minimum fan speed (1-4) : Level 1
```

Controller temperature threshold : 71C/159F (critical)
61C/141F (warning)

| ===== | | |
|-------|------------|---------|
| ID | Location | Voltage |
| ===== | | |
| 1 | I/O Module | 4.825V |
| 2 | I/O Module | 12.360V |
| ----- | | |

Enclosure Settings List

The Enclosure command enables you to make settings for the enclosure.

- **Enclosure Warning Temperature** – Measured at the backplane. Fan speed increases until temperature falls below the threshold.
- **Enclosure Critical Temperature** – Measured at the backplane. Temperature value for automatic shutdown.
- **Controller Warning Temperature** – Measured inside the I/O module. Fan speed increases until temperature falls below the threshold.
- **Controller Critical Temperature** – Measured inside the I/O module. Temperature value for automatic shutdown.
- **Thermal Management** – Monitors enclosure temperature, adjusts fan speeds, displays red LED on cooling unit when a fan fails
- **Automatic Shutdown** – Shuts down the ASUS Storage DS300j unit 30 seconds after the enclosure or controller reaches critical temperature.
- **Minimum Fan Speed** – Specifies the minimum fan speed when the ASUS Storage reaches enclosure or controller warning temperature.

Making Enclosure Settings

To set the enclosure warning temperature to 51°C (141°F):

At the cli> prompt, type **enclosure -a mod -s "enc_warning=51"** and press Enter.

Warning temperature range is 10° to 51°C (50° to 123°F)

To set the enclosure critical temperature to 61°C (141°F):

At the cli> prompt, type **enclosure -a mod -s "enc_critical=61"** and press Enter.

Critical temperature range is 51° to 61°C (123° to 141°F)

To set the controller warning temperature to 51°C (141°F):

At the cli> prompt, type **enclosure -a mod -s "ctrl_warning=75"** and press Enter.

Warning temperature range is 10° to 75°C (50° to 172°F)

To set the controller critical temperature to 61°C (141°F):

At the cli> prompt, type **enclosure -a mod -s "ctrl_critical=90"** and press Enter.

Critical temperature range is 75° to 90°C (172° to 194°F)

To enable Thermal Management:

At the cli> prompt, type **enclosure -a mod -s "thermalmanager=1"** and press Enter.

For this command, a **1** enables and a **0** disables.

To enable Automatic Shutdown:

At the cli> prompt, type **enclosure -a mod -s "allowshutdown=1"** and press Enter.

For this command, a **1** enables and a **0** disables.



Caution

ASUS recommends that you keep Automatic Shutdown enabled at all times.

To set the minimum fan speed to medium high:

At the cli> prompt, type **enclosure -a mod -s "minfanspeed=3"** and press Enter.

For this command:

- **1** means low
- **2** means medium-low
- **3** means medium-high
- **4** means high

The actual speed depends on the fan manufacturer.

Factory Default Command

The factory default command enables you to restore factory default settings in the ASUS Storage DS300j unit.

To restore the enclosure to the default settings:

At the cli> prompt, type **factorydefault -a mod -s "default=1"** and press Enter.

Or, at the cli> prompt, type **factorydefaults** and press Enter.

When the cli> prompt appears again, all settings have been restored to the default values.

Help Command

The CLI uses the standard Unix online help system.

To access general help:

At the cli> prompt, type **help** and press Enter.

To access help with a specific function:

At the cli> prompt, type **help** followed by the name of the function and press Enter.

Or, at the cli> prompt, type the name of the function followed by **-h** and press Enter.

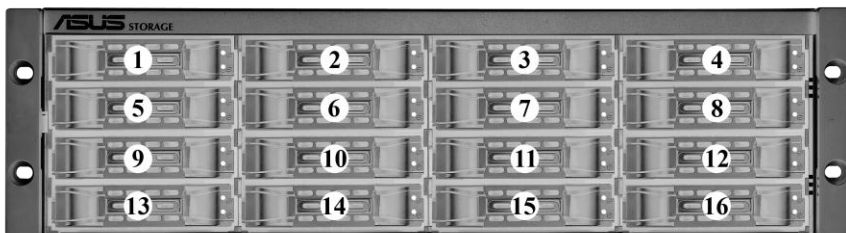
See “CLI Command Set” on page 21 for a list of supported functions.

Link Command

The Link command displays information about ASUS Storage links, including:

- Link Status (page 27)
- Link Statistics (page 28)
- Clearing Statistics (page 29)
- Expander SAS Addresses (page 29)
- Attached SAS Addresses (page 29)

Figure 6. *DS300j unit drive slot numbering*



Viewing Link Status

To view link status:

At the cli> prompt, type **link** and press Enter.

The system returns:

Link Status:

| Phy | Port | Type | Rate | Init | Dev | Link | PRdy |
|----------------------|-------|-------------------|------|-------------------|------|------|------|
| 0 | DSK01 | SAS | 3.0G | OK | End | ---- | Rdy |
| 1 | DSK02 | SAS | 3.0G | OK | End | ---- | Rdy |
| 2 | DSK03 | SAS | 3.0G | OK | End | ---- | Rdy |
| 3 | DSK04 | SAS | 3.0G | OK | End | ---- | Rdy |
| 4 | DSK05 | SAS | 3.0G | OK | End | ---- | Rdy |
| 5 | DSK06 | SAS | 3.0G | OK | End | ---- | Rdy |
| 6 | DSK07 | SAS | 3.0G | OK | End | ---- | Rdy |
| 7 | DSK08 | SAS | 3.0G | OK | End | ---- | Rdy |
| 8 | DSK09 | SAS | 3.0G | OK | End | ---- | Rdy |
| 9 | DSK10 | SAS | 3.0G | OK | End | ---- | Rdy |
| 10 | DSK11 | SAS | 3.0G | OK | End | ---- | Rdy |
| 11 | DSK12 | SAS | 3.0G | OK | End | ---- | Rdy |
| 12 | DSK13 | SAS | 3.0G | OK | End | ---- | Rdy |
| 13 | DSK14 | SAS | 3.0G | OK | End | ---- | Rdy |
| 14 | DSK15 | SAS | 3.0G | OK | End | ---- | Rdy |
| 15 | DSK16 | SAS | 3.0G | OK | End | ---- | Rdy |
| 16 | CN#1 | ---- | ---- | ---- | ---- | ---- | ---- |
| 17 | CN#1 | ---- | ---- | ---- | ---- | ---- | ---- |
| 18 | CN#1 | ---- | ---- | ---- | ---- | ---- | ---- |
| 19 | CN#1 | ---- | ---- | ---- | ---- | ---- | ---- |
| 20 | CN#2 | SAS | 3.0G | OK | End | ---- | Rdy |
| 21 | CN#2 | SAS | 3.0G | OK | End | ---- | Rdy |
| 22 | CN#2 | SAS | 3.0G | OK | End | ---- | Rdy |
| 23 | CN#2 | SAS | 3.0G | OK | End | ---- | Rdy |
| Phy : PHY ID | | Port: Port Id | | Type: SAS or SATA | | | |
| Rate: Rate 3G/6G | | Init: Init Passed | | Dev : Device Type | | | |
| Link: Link Connected | | PRdy: Phy Ready | | | | | |

The following items are reported in the table above:

- **Phy** – Each link is a PHY, numbered 0 through 23

- **Port** – DSK01 through DSK16 represent drive slots. Each slot has one PHY. See page 26, Figure 6.
CN#1 refers to the SAS IN port and CN#2 refers to the SAS OUT port on the I/O module. Each port has four PHYs. See page 21, Figure 4.
- **Type** – Physical drive type, SAS or SATA
- **Rate** – Physical drive data rate, 3.0 Gb/s
- **Dev** – Device type. End means an end device. Exp means an expansion device
- **Link** – Normally, ---- is displayed. If there is a connection at the moment the link command runs, it displays CONN
- **PRdy** – PHY Ready Status. If the port is ready, it displays Rdy

Viewing Link Statistics

To view link status:

1. At the cli> prompt, type **link** and press Enter.
2. Scroll down to Link Statistics.

The screen displays:

Link Statistics:

| Phy | Type | InDW | DsEr | DwLo | PhRe | CoVi | PhCh |
|-----|-------|-------|-------|-------|-------|-------|------|
| 0 | DSK01 | ----- | ----- | ----- | ----- | ----- | 0x11 |
| 1 | DSK01 | ----- | ----- | ----- | ----- | ----- | 0x61 |
| 2 | DSK01 | ----- | ----- | ----- | ----- | ----- | 0x0D |
| 3 | DSK01 | ----- | ----- | ----- | ----- | ----- | 0x0D |
| 4 | DSK01 | ----- | ----- | ----- | ----- | ----- | 0x01 |
| 5 | DSK01 | ----- | ----- | ----- | ----- | ----- | 0x61 |
| 6 | DSK01 | ----- | ----- | ----- | ----- | ----- | 0x11 |
| 7 | DSK01 | ----- | ----- | ----- | ----- | ----- | 0x0D |
| 8 | DSK01 | ----- | ----- | ----- | ----- | ----- | 0x0D |
| 9 | DSK01 | ----- | ----- | ----- | ----- | ----- | 0x01 |
| 10 | DSK01 | ----- | ----- | ----- | ----- | ----- | 0x0D |
| 11 | DSK01 | ----- | ----- | ----- | ----- | ----- | 0x0D |
| 12 | DSK01 | ----- | ----- | ----- | ----- | ----- | 0x01 |
| 13 | DSK01 | ----- | ----- | ----- | ----- | ----- | 0x5D |
| 14 | DSK01 | ----- | ----- | ----- | ----- | ----- | 0x0D |
| 15 | DSK01 | ----- | ----- | ----- | ----- | ----- | 0x09 |
| 16 | CN#1 | ----- | ----- | ----- | ----- | ----- | ---- |

| | | | | | | | |
|----|------|-------|-------|-------|-------|-------|------|
| 17 | CN#1 | ----- | ----- | ----- | ----- | ----- | ---- |
| 18 | CN#1 | ----- | ----- | ----- | ----- | ----- | ---- |
| 19 | CN#1 | ----- | ----- | ----- | ----- | ----- | --- |
| 20 | CN#2 | ----- | ----- | ----- | ----- | ----- | 0x8F |
| 21 | CN#2 | ----- | ----- | ----- | ----- | ----- | 0x8F |
| 22 | CN#2 | ----- | ----- | ----- | ----- | ----- | 0x8F |
| 23 | CN#2 | ----- | ----- | ----- | ----- | ----- | 0x8F |

The following items are reported in the table above. All counts are hexadecimal:

- **Phy** – Each link is a PHY, numbered 0 through 23
- **Port** – DSK01 through DSK16 represent drive slots. Each slot has one PHY. See page 26, Figure 6.

CN#1 refers to the SAS IN port and CN#2 refers to the SAS OUT port on the I/O module. Each port has four PHYs. See page 21, Figure 4.

- **InDW** – Invalid D-word Count
- **DsER** – Disparity Error Count
- **DwLo** – Dword Sync Loss Count
- **PhRe** – PHY Reset Problem Count
- **CoVi** – Code Violation Count
- **PhCh** – PHY Change Count

If the count is zero, the counter shows dashes (-----).

The fact that errors occur does not necessarily indicate a problem or that the ASUS Storage unit is malfunctioning.

An individual error count that increments regularly indicates a possible problem and requires further investigation.

Clearing Statistics

To clear the link error statistics:

At the **cli>** prompt, type **link -a clear -c "stats"** and press Enter.

Viewing SAS Addresses

To view SAS addresses:

1. At the **cli>** prompt, type **link** and press Enter.
2. Scroll down to Expander SAS Addresses or Attached SAS Addresses.

The screen displays:

Expander SAS Addresses:

| Type | SAS Address |
|------|-------------------------|
| Base | 50 00 15 5D 21 12 22 00 |
| SSP | 50 00 15 5D 21 12 22 3E |
| SMP | 50 00 15 5D 21 12 22 3F |

Attached SAS Addresses:

| Port | SAS Address |
|-------|-------------------------|
| DSK01 | 50 00 15 E0 11 4E 5E B2 |
| DSK02 | 50 00 15 E0 11 4E 80 C2 |
| DSK03 | 50 00 15 E0 11 4C 22 02 |
| DSK04 | 50 00 15 E0 11 4D E2 22 |
| DSK05 | 50 00 15 E0 11 4D 8F B2 |
| DSK06 | 50 00 15 E0 11 4D D0 62 |
| DSK07 | 50 00 15 E0 11 4D DE E2 |
| DSK08 | 50 00 15 E0 11 4D 8E F2 |
| DSK09 | 50 00 15 E0 11 4C 97 62 |
| DSK10 | 50 00 15 E0 11 4C 36 62 |
| DSK11 | 50 00 00 E0 11 4F 18 E2 |
| DSK12 | 50 00 00 E0 11 4F 18 D2 |
| DSK13 | 50 00 00 E0 11 4D 8E 52 |
| DSK14 | 50 00 00 E0 11 4D E2 22 |
| DSK15 | 50 00 00 E0 11 4E 49 C2 |
| DSK16 | 50 00 00 E0 11 4D DC F2 |
| CN#1 | No Device Attached |
| CN#2 | 50 00 15 5F FF C0 22 3F |

The following items are reported in the table above:

- **Port** – DSK01 through DSK16 represent drive slots. Each slot has one PHY. See page 26, Figure 6.
CN#1 refers to the SAS IN port and CN#2 refers to the SAS OUT port on the I/O module. Each port has four PHYs. See page 21, Figure 4.
- **SAS Address** – The SAS address of the drive slot or the port.

Route Command

To view the SAS addresses of the devices in your domain:

At the cli> prompt, type **route -a list** and press Enter.

The system returns:

Routing Table Mapping:

| Entry# | SAS Address | CnID |
|--------|------------------|------|
| ----- | | |
| 0159 | 500000E0114D8FB2 | CN#2 |
| 0163 | 500000E0114C2252 | CN#2 |
| 0202 | 500000E0120B3562 | CN#2 |
| 0238 | 500000E01212F582 | CN#2 |
| 0287 | 500000E0120B26B2 | CN#2 |
| | | |
| 0365 | 5000155FFFC0223E | CN#2 |
| 0462 | 500000E0114F18F2 | CN#2 |
| 0468 | 500000E01205B472 | CN#2 |
| 0542 | 500000E01122C5B2 | CN#2 |
| 0624 | 500000E0114E4A32 | CN#2 |
| | | |
| 0639 | 500000E0114D8E32 | CN#2 |
| 0700 | 500000E0120B2A62 | CN#2 |
| 0721 | 500000E0114DE7A2 | CN#2 |
| 0751 | 500000E0114E5EA2 | CN#2 |
| 0764 | 500000E0120B28F2 | CN2 |
| | | |
| 0765 | 500000E0114C2342 | CN#2 |
| 0977 | 500000E0120A2472 | CN#2 |
| 1023 | 5000155FFFC02408 | CN#2 |
| ----- | | |

The route command displays SAS addresses that are attached to the SAS ports of the ASUS Storage unit. Three items are reported:

- **Entry#** – Arbitrary numbers, listed in sequence
- **SAS Address** – Of the disk drive or other component
- **CnID** – External SAS port connector

CN#1 refers to the SAS IN port and CN#2 refers to the SAS OUT port on the I/O module. Each port has four PHYs. See page 21, Figure 4.

Route Troubleshooting

If your system returns:

```
No SAS Routing Entry Exists
```

...it indicates that no downstream devices are found.

Uptime Command

The uptime command informs you of the elapsed period of time since the ASUS Storage unit was powered on.

To display uptime:

At the cli> prompt, type **uptime** and press Enter.

The system returns:

```
System has been running 1 day 9 hours 46 minutes 36 seconds
```

VPDR Command

The vpdr command displays vital product data on the major components of the ASUS Storage enclosure.

To display vital product data:

At the cli> prompt, type **vpdr -i** and the number of the component, and press Enter.

For this command:

- **1** – Controller (I/O module)
- **6** – Backplane

For example, **vpdr -i 1** returns:

```
Board ID           :0
OEM Name           :ASUS
OEM Model          :Cx20s-Jbod
Mfg Part           :IOC-C620s-01
Mfg SN             :B17D07138400004
Mfg Rev            :A1R1.0
Mfg Date           :2009:02:15
WWN                :20 00 01 01 55 FF FC 0D
```

? Command

The VTrak CLI uses the standard Unix online help system.

To access help with a specific function, do one of the following actions:

- At the cli> prompt, type ? followed by the name of the function and press Enter.
- At the cli> prompt, type the name of the function followed by -? and press Enter.

See “CLI Command Set” on page 21 for a list of supported functions.

Chapter 4: Maintenance

This chapter covers the following topics:

- Updating the Firmware (below)
 - Replacing a Power Supply (page 39)
 - Replacing an I/O Module (page 40)
 - Replacing a Cooling Fan (page 41)
-

Updating the Firmware

There are two ways to update the ASUS Storage DS300j's firmware.

- Through a ASUS Storage DS300F or DS300I subsystem using ASUS Storage Management
- With the JBOD Flash Utility

Downloading the Firmware Image File

Go to the ASUS support web site <http://support.asus.com/> and download the latest firmware image (.img) file to your TFTP server or your PC. The firmware update image file includes all of the files for the ASUS Storage DS300j unit.

Updating Firmware in ASUS Storage Management

You can use this procedure if your ASUS Storage DS300j unit is managed by a ASUS Storage DS300F or DS300I subsystem. This procedure updates the firmware on the DS300F or DS300I subsystem and any attached DS300j units through ASUS Storage Management.



For more information on ASUS Storage Management, see “Chapter 4: Management with ASUS Storage Management” and “Chapter 8: Maintenance” in the *ASUS Storage DS300F, DS300I User Manual*.



Warning

Do not restart the ASUS Storage subsystem or unit during a firmware upgrade procedure. Wait until you see the *Flash image completed* message.

To update the firmware:

1. Click the Subsystem  icon.
2. Click the Software Management  icon.
3. Click the **Firmware Update** tab.

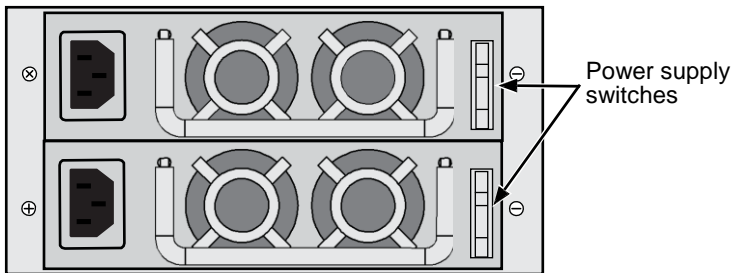
4. Do one of the following actions:
 - Click the *Download Flash File from TFTP Server* option, then click the **Next** button.
 - Click the *Download Flash File from Local File through HTTP* option, then click the **Next** button.
5. For the TFTP Server option:
 - Enter the hostname or IP address of your TFTP server in the field provided.
 - Enter the port number of your TFTP server in the field provided (69 is the default).
 - Enter the filename of the Firmware Update file in the field provided. The filename is similar to *exp.fw.2.03.0000.00.bin*.
 - Click the **Submit** button.

For the Local File option:

- Click the **Browse** button.
 - Navigate to the Firmware Update file. The filename is similar to *exp.fw.2.03.0000.00.bin*.
 - Click the file, then click the **Open** button.
 - Click the **Submit** button.
6. When the download is completed, click the **Next** button.

A popup message appears warning you not to reboot the ASUS Storage during the firmware update procedure.
 7. In the popup message, click the **OK** button.

The update progress displays. Then a popup message appears to tell you to reboot the ASUS Storage.
 8. In the popup message, click the **OK** button.
 9. Restart the DS300F or DS300I subsystem and the DS300j units:
 - Shut down the DS300F or DS300I subsystem. See the *ASUS Storage DS300F, DS300I User Manual*.
 - On the ASUS Storage DS300j units, turn OFF the power supply switches. See page 37, Figure 1.
 - Wait 30 seconds, then turn ON the DS300j unit's power supply switches.
 - Wait 30 additional seconds, then turn ON the DS300F or DS300I subsystem's power supply switches.

Figure 1. DS300j power supply switches

To verify the firmware update:

At the cli> prompt, type **enclosure** and press Enter.

For more information, see “Enclosure Command” on page 22.



Note

After you click the **Submit** button, if ASUS Storage Management displays this message: *error transferring image*, you entered an incorrect file name or an incorrect location. Check the information and try again.

Updating Firmware with the JBOD Flash Utility

The download firmware image (.img) file package includes a Windows-based utility to update the firmware on the ASUS Storage DS300j unit. The JBOD utility:

- Updates firmware on ASUS Storage subsystems only
- Updates one ASUS Storage at a time
- Runs on Windows PCs over a RS232 serial connection
- Works with any RAID system configuration

Preparing the Utility

To prepare the utility:

1. Verify that your serial connection from your PC to the DS300j unit is online. See “Setting up the Serial Connection” on page 16.
2. Unzip the firmware download, locate and open the *expfwdlutil* folder.

The utility file is **expfwdlutil_<version number>.exe**.

By default, the utility connects to the DS300j unit through the Host PC's COM1 port.

If you are using a different COM port, you must change the port setting in the configuration file.

To access the configuration file and change the COM port setting:

1. Double click the **expfwdlutil_<version number>.exe** file to start the utility.
2. In the Flash Utility dialog box, click the **Quit** button. In the Warning box, click the **Yes** button.

When the utility opened, it created a **fwdl.ini** file in the same directory.

3. Open the **fwdl.ini** configuration file in a text editor and change the *comport* number as required.

```
[settings]
file=
comport=1
```

The *file* value fills in automatically when you run the utility.

Save and close the **fwdl.ini** file.

Updating the Firmware



Warning

Do not restart the DS300j unit during a firmware upgrade procedure. Wait until you see the *Firmware download finished successfully* message.

To update the firmware:

1. Double click the **expfwdlutil_<version number>.exe** file.
The Flash Utility dialog box appears.
2. Click the **Browse** button and navigate to the Firmware Update file in the *firmware* folder.

The firmware file is **exp.fw.<version number>.bin**.

3. Click the file, then click the **Open** button.
4. Click the **Start** button.

The update begins. You can monitor progress on the Progress bar. The operation takes about four minutes.

5. When you see the message:

Firmware download finished successfully.

Please power cycle the system for the new firmware to take effect.

Click the **Quit** button. In the Warning box, click the **Yes** button.

6. Restart the DS300j unit:
 - Turn OFF the power supply switch (switches). See page 37, Figure 1.

- Wait 30 seconds, then turn ON the power supply switches.

To verify the firmware update:

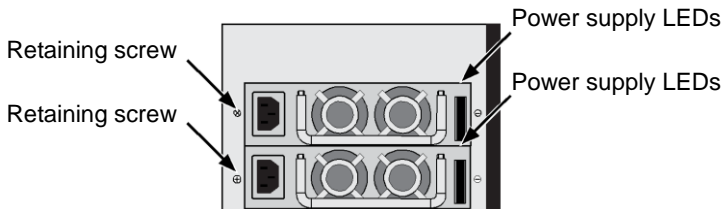
At the cli> prompt, type **enclosure** and press Enter.

For more information, see “Enclosure Command” on page 22.

Replacing a Power Supply

The redundant power supplies on the ASUS Storage DS300j unit are designed as field-replaceable units. You can replace a power supply without removing the DS300j unit from the rack.

Figure 2. Replacing a Power Supply



Removing the old power supply

To remove the power supply:

1. Verify that the power supply LED is amber or red.
2. Switch off the power to the power supply you plan to replace.
3. Unplug the power cord.
4. Loosen and remove the retaining screw on the left side of the power supply.
5. Pull the power supply out of the DS300j enclosure.

Installing the new power supply

To install the power supply:

1. Carefully slide the power supply into the enclosure.
2. Install and tighten the retaining screw on the left side of the power supply.
3. Plug in the power cord.
4. Switch on the power supply.
5. Verify that the new power supply LED is green.

This completes the power supply replacement procedure.

Replacing an I/O Module

The I/O module monitors and manages the logical drives. When the I/O module is replaced, all of your logical drive data and configurations remain intact because this logical drive information is stored on the disk drives.

I/O modules rarely fail. But you might have to remove and reinstall the same I/O module in order to replace a cooling fan as described in this chapter.



Caution

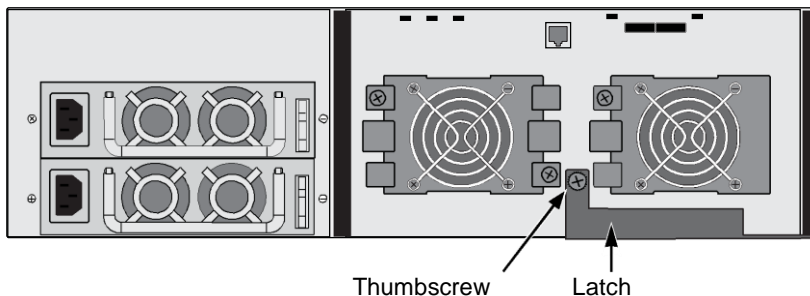
- Do not replace the I/O module based on LED colors alone. Only replace the I/O module when directed to do so by ASUS Technical Support. See page 44.
 - Only a qualified technician should perform this procedure.
 - You must shut down the ASUS Storage DS300j unit before you can perform this procedure.
-

Removing the old I/O module

To replace the I/O module:

1. Shut down the DS300j unit. Turn OFF the power supply switch (switches). See page 37, Figure 1.
2. Disconnect the SAS, serial, and power cables.
3. On the I/O module, loosen the thumbscrew, swing the latch to the right and pull the I/O module out of the enclosure. See Figure 3.

Figure 3. Removing the I/O module



Installing the new I/O module

1. Carefully slide the new I/O module into the enclosure.
2. Swing the latch to the left and secure it with the thumbscrew.
3. Reconnect the SAS, serial, and power cables.

4. Switch on the power.

Turn ON the power supply switch (switches).

For more information about DS300j's start-up behavior, see "Connecting the Power" on page 14.

This completes the I/O module replacement procedure.

Replacing a Cooling Fan



Cautions

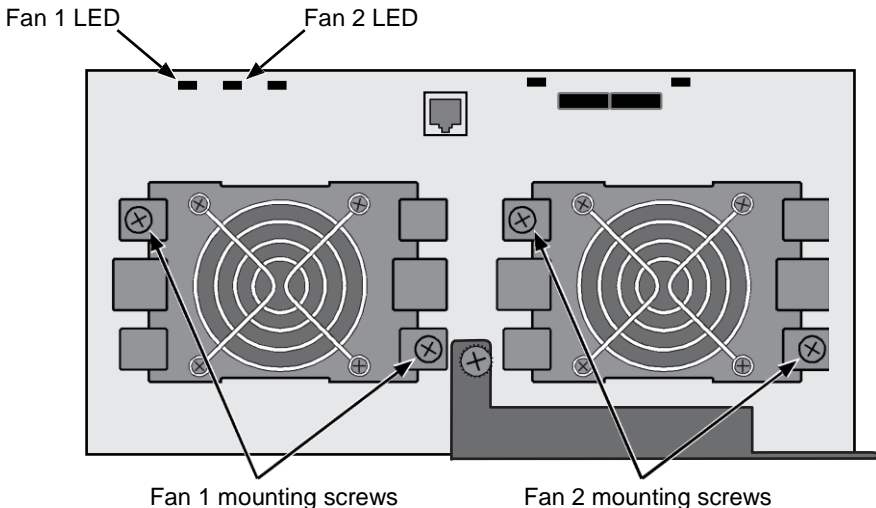
Only a qualified technician should perform this procedure.

The ASUS Storage DS300j has externally mounted fans that are replaceable without shutting down the DS300j unit.

To replace a fan:

1. Verify that the Fan LED on the I/O module is amber or red. See Figure 4.

Figure 4. Fan LEDs and mounting screws



2. Remove the two fan mounting screws.
3. Draw the fan away from the I/O module and unplug the fan's power wire.
4. Connect the new fan's power wire.

5. Place the new fan onto the I/O module and install the two mounting screws.
This completes the fan replacement procedure.

Chapter 5: Support

This chapter covers the following topics:

- Frequently Asked Questions (below)
 - Contacting Technical Support (page 44)
 - Limited Warranty (page 45)
 - Returning the Product For Repair (page 47)
-

Frequently Asked Questions

What kind of disk drives can I use with ASUS Storage DS300j?

The DS300j supports 3.0 GB/s Serial ATA disk drives and 3.0 Gb/s SAS drives.

The DS300j does not support Parallel ATA (PATA) disk drives.

How can I tell when the ASUS Storage DS300j has fully booted?

When the DS300j unit is fully booted up, the Power and FRU LEDs will light up green. The heartbeat LED blinks green once a second.

What happens if a disk drive fails?

Depending on the nature of the failure, the failed drive the drive might not appear in the CLI – or the failed drive might appear with some errors – when you run the **link** command. See page 26.

Can I hot-swap a failed drive with a new one?

Yes. Disk drives are hot-swappable on the ASUS Storage DS300j unit.

Can a ASUS Storage unit run on just one power supply?

Yes, it is possible to run the ASUS Storage unit on a single power supply. There are two power supplies so that the unit will continue running if one of the power supply fails. But deliberately leaving one power supply off negates this advantage.

In addition, leaving one power supply off reduces air flow through the unit enclosure and can contribute to overheating. Always switch on both power supplies.

Contacting Technical Support

ASUS Technical Support provides several support options for ASUS users to access information and updates. We encourage you to use one of our electronic services, which provide product information updates for the most efficient service and support.

If you decide to contact us, please have the following information available:

- Product model and serial number
- BIOS, firmware, and driver version numbers
- A description of the problem / situation
- System configuration information, including: motherboard and CPU type, hard drive model(s), SAS/SATA/ATA/ATAPI drives & devices, and other controllers.

Technical Support Services

| | |
|------------------------|-----------------------------------------------------------------|
| ASUS Technical Support | http://support.asus.com/ |
|------------------------|-----------------------------------------------------------------|

Limited Warranty

ASUS Technology, Inc. ("ASUS") warrants that this product, from the time of the delivery of the product to the original end user:

- a) all components, except the cache backup battery, for a period of three (3) years;
- b) the cache backup battery, for a period of one (1) year;
- c) will conform to ASUS's specifications;
- d) will be free from defects in material and workmanship under normal use and service.

This warranty:

- a) applies only to products which are new and in cartons on the date of purchase;
- b) is not transferable;
- c) is valid only when accompanied by a copy of the original purchase invoice.
- d) Is not valid on spare parts.

This warranty shall not apply to defects resulting from:

- a) improper or inadequate maintenance, or unauthorized modification(s), performed by the end user;
- b) operation outside the environmental specifications for the product;
- c) accident, misuse, negligence, misapplication, abuse, natural or personal disaster, or maintenance by anyone other than a ASUS or a ASUS-authorized service center.

Disclaimer of other warranties

This warranty covers only parts and labor, and excludes coverage on software items as expressly set above.

Except as expressly set forth above, ASUS DISCLAIMS any warranties, expressed or implied, by statute or otherwise, regarding the product, including, without limitation, any warranties for fitness for any purpose, quality, merchantability, non-infringement, or otherwise. ASUS makes no warranty or representation concerning the suitability of any product for use with any other item. You assume full responsibility for selecting products and for ensuring that the products selected are compatible and appropriate for use with other goods with which they will be used.

ASUS DOES NOT WARRANT that any product is free from errors or that it will interface without problems with your computer system. It is your responsibility to back up or otherwise save important data before installing any product and continue to back up your important data regularly.

No other document, statement or representation may be relied on to vary the terms of this limited warranty.

ASUS's sole responsibility with respect to any product is to do one of the following:

- a) replace the product with a conforming unit of the same or superior product;
- b) repair the product.

ASUS shall not be liable for the cost of procuring substitute goods, services, lost profits, unrealized savings, equipment damage, costs of recovering, reprogramming, or reproducing of programs or data stored in or used with the products, or for any other general, special, consequential, indirect, incidental, or punitive damages, whether in contract, tort, or otherwise, notwithstanding the failure of the essential purpose of the foregoing remedy and regardless of whether ASUS has been advised of the possibility of such damages. ASUS is not an insurer. If you desire insurance against such damage, you must obtain insurance from another party.

Some states do not allow the exclusion or limitation of incidental or consequential damages for consumer products, so the above limitation may not apply to you.

This warranty gives specific legal rights, and you may also have other rights that vary from state to state. This limited warranty is governed by the laws of Taiwan (ROC).

Your Responsibilities

You are responsible for determining whether the product is appropriate for your use and will interface with your equipment without malfunction or damage. You are also responsible for backing up your data before installing any product and for regularly backing up your data after installing the product. ASUS is not liable for any damage to equipment or data loss resulting from the use of any product.

Returning the Product For Repair

If you suspect a product is not working properly, or if you have any questions about your product, contact our Technical Support Staff through one of our Technical Services, making sure to provide the following information:

- Product model and serial number (required)
- Return shipping address
- Daytime phone number
- Description of the problem
- Copy of the original purchase invoice

The technician will assist you in determining whether the product requires repair. If the product needs repair, the Technical Support Department will issue an RMA (Return Merchandise Authorization) number.



Important

Obtain an RMA number from Technical Support *before* you return the product and write the RMA number on the label. The RMA number is essential for tracking your product and providing the proper service.

Return **ONLY** the specific product covered by the warranty (do not ship cables, manuals, diskettes, etc.), with a copy of your proof of purchase to:

You must follow the packaging guidelines for returning products:

- Use the original shipping carton and packaging
- Include a summary of the product's problem
- Write an attention line on the box with the RMA number
- Include a copy of proof of purchase

You are responsible for the cost of insurance and shipment of the product to ASUS. Note that damage incurred due to improper transport or packaging is not covered under the Limited Warranty.

When repairing returned products, ASUS may replace defective parts with new or reconditioned parts, or replace the entire unit with a new or reconditioned unit. In the event of a replacement, the replacement unit will be under warranty for the remainder of the original warranty term from purchase date, or 30 days, whichever is longer.

ASUS will pay for standard return shipping charges only. You will be required to pay for any additional shipping options (such as express shipping).

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